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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/080,114	02/21/2002	Kanwarpal S. Dhugga	1301	1712

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EXAMINER	
IBRAHIM, MEDINA AHMED	
ART UNIT	**PAPER NUMBER**
1638	

DATE MAILED: 01/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/080,114	DHUGGA ET AL	
	Examiner	Art Unit	
	Medina A Ibrahim	1638	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 November 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11 and 13-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11 and 13-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Applicant's response filed 11/01/04 in reply to the Office action of 06/30/04 has been entered. Claims 1-2, 4, 9, 11, 13, and 17 are amended. Claim 12 is cancelled. Therefore, claims 1-11and 13-21 are pending and are examined.

Sequence Listing

The sequences of Figures 8 and 9 have not been identified by SEQ ID NO: under the "Brief Description of the Drawing" on page 9 of the specification, as stated in the Office action of 06/30/04. In the response of 11/01/04, Applicant has neither amended nor argued against the requirement. Appropriate correction is required.

Claim Rejections - 35 USC § 112

Claims 1-11 and 13-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is indefinite a polynucleotide that is complementary to SEQ ID NO: 1 or 11 cannot encode a sucrose synthase. Appropriate correction is required to more clearly define the metes and bounds of the claims. Dependent claims 2-11 are included in the rejection.

Claim 2 is indefinite a polynucleotide that is antisense to SEQ ID NO: 1 or 11 cannot encode a sucrose synthase.

Claim 11 is indefinite because in part (c), the claim recites "at least one polypeptide encoded by a polynucleotide of claim1". Part (d) of claim 1 cannot encode a polypeptide.

Claim 11 is also indefinite in the recitation of "using GAP" without any active, positive steps delimiting how this use is actually practiced. It is unclear what steps applicant is intending to encompass. This rejection is repeated for the reasons of record as set forth in the last Office action of 06/30/04. Applicants argue that the use of GAP is disclosed in the specification, and that one skilled in the art would know that sequence similarity is described by GAP. Applicants, therefore, assert that the claim is definite. Applicants request that the rejection be withdrawn. This is not found persuasive because the instant rejection is based on lack of definiteness rather than lack of written description or how to use GAP. While one skilled in the art would know how to use GAP, the claim is directed to a method for modulating sucrose synthase level rather than a method of using GAP to describe a polynucleotide. It is suggested that "using" be replaced with ---by----, as in claim 1.

Claim Rejections - 35 USC § 112

Claims 1-11 and 13-21 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the isolated polynucleotide of SEQ ID NO: 1 or 11 encoding a polypeptide having sucrose synthase activity, a recombinant expression cassette comprising sense or the antisense of SEQ ID NO: 1 or 11, host cells, and transgenic plants/seed comprising said polynucleotide and a method of

transforming a plant with said polynucleotide, does not reasonably provide enablement for an isolated polynucleotide that is complementary to SEQ ID NO: 1 or 11 and encoding a polypeptide having sucrose synthase activity, antisense of all polynucleotides encoding SEQ ID NO: 2 or 12, transgenic plant comprising said polynucleotides and a method of expressing any polynucleotide encoding a polypeptide having sucrose synthase activity in a transgenic plant for an increased cellulose production/concentration in the stalk and in the tissues of seed of a transgenic plant. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention commensurate in scope with these claims. This rejection is repeated for the reasons set forth in the Office action of 06/30/04. Applicant's arguments filed in 11/0104 have been considered but are not deemed persuasive.

Applicant asserts that the specification discloses specific details about the expression of the claimed polynucleotides in a transgenic host cell including monocot and dicot plant cells, and as a result increasing or decreasing the concentration of sucrose synthase in transgenic plant tissues. Applicant argues that specific working examples are not required in the specification for enablement purposes. Applicant cites In re Honn 364 F.2d 454, 150 USPQ 652 (C.C. P.A. 1966) to support this position (response, p. 14).

This is not persuasive because claims broadly drawn to a method for increasing concentration of cellulose synthase in a transgenic plant/stalk/seed by transforming the plant with any polynucleotide encoding a sucrose synthase, recombinant expression

cassette comprising antisense of all polynucleotides encoding SEQ ID NO: 2 or 12 are not supported by an enabling disclosure for the following reasons: firstly, Applicant has provided no evidence to support the conclusion that the expression of a single enzyme, namely sucrose synthase, in the cellulose biosynthesis pathway will affect the final concentration of cellulose in the stalk of any transgenic plant. Secondly, since plants contain differentially expressed multiple sucrose synthase genes (as evidenced by Applicant's own specification, pages 2-3), it is unclear as to whether expression of a single gene can be used to regulate the cellulose concentration in specific plant tissues. Thirdly, since sucrose synthase (Susy) genes encode isoenzymes that differ remarkably in their expression patterns as evidenced by Applicant's own specification (page 3), the antisense expression may not be sufficient to inhibit the expression of all isoenzymes in the plant. In addition, a search of the prior art does not indicate that all sucrose synthase genes are associated with cell wall formation in all plant species. Therefore, increase the level of sucrose synthase in the plant does not necessarily result in increased concentration of cellulose in the stalk or seed.

Regarding Applicant's arguments on working examples, it is noted that while the absence of working examples should not be the sole reason for non-enablement, it is a factor to be considered, especially in a case involving an unpredictable and undeveloped art. The state of the art teaches that sucrose synthases catalyze the reversible conversion of sucrose and UDP into UDP-glucose and fructose. The art also teaches that enzymes differ in their expression patterns and tissue localization. While several Susy encoding polynucleotides have been isolated from various plants, the

mechanisms for regulation of the enzymatic activity in transgenic plants are not well understood (Huber et al. Plant Physiology (1996) 112:793-802). In addition, a number of enzymes including Susy are known to be involved in the cellulose biosynthetic pathway, and it is not clear to what extent the control of only one of these enzymes would be successful in controlling cellulose biosynthesis.

The instant specification fails to provide guidance with respect to the ability of any sucrose synthase encoding polynucleotide to alter cellulose concentration in specific plant tissues. And unlike In re Honn 364 F.2d 454, 150 USPQ 652 (C.C. P.A. 1966) case law cited in Applicant's response of 11/01/04 , the instant specification does not provide sufficient working procedure that one skilled in the art may practice the invention as claimed without undue experimentation.

Genentech Inc. v. Novo Nordisk A/S, 108 F.3d 1361, 1366, 42 USPQ2d 1001, 1005 (Fed. Cir. 1997): " It is the specification, not the knowledge of one skilled in the art, that must supply the novel aspects of an invention in order to constitute adequate enablement". The *Genentech* court also held that ["(P)atent protection is granted in return for an enabling disclosure of an invention, not for vague intimations of general ideas that may or may not be workable. While every aspect of a generic claim certainly need not have been carried out by an inventor, or exemplified in the specification, reasonable detail must be provided in order to enable members of the public to understand and carry out the invention". Id. In this application, Applicant is expecting from other to identify which Susy polynucleotide encodes a functional sucrose synthase in a transgenic plant, and then determine through the myriad of transgenic plants

transformed with each of the claimed Susy polynucleotides (known and yet to be discovered) in sense and antisense orientation to identify which would alter cellulose concentrations in a plant or specific plant tissues. Under the guideline set forth in *Genentech*, this constitutes undue experimentation. No guidance has been provided for the antisense of all other polynucleotides encoding SEQ ID NO: 2 or 12. Given the degeneracy of the code, many of the polynucleotides encoding SEQ ID NO: 2 or 12 share relatively little sequence identity, and are significantly divergent from the polynucleotide of SEQ ID NO: 1 or 11, and hence may not inhibit the targeted endogenous gene.

The state of the prior art teaches unpredictability in the inhibition of expression of specific coding sequence via antisense RNA in transgenic plants, due to the variation in the degree of antisense inhibition which resulted in different transgenic clones (see, e.g., BIRD et al, Biology and Genetic Review, vol. 9, pages 207-227 (1991)) and due to the mechanism of inhibition of gene expression by means of antisense mRNA which is not universally effective and is poorly understood (Sandler et al (Plant Molecular Biology, vol. 11, pp. 301-310 (1988), see, e.g., page 301, Abstract; page 302, column 1, top two paragraphs). Napoli et al (The Plant Cell, vol. 2, pp. 279-289, 1990) also teach unpredictability inherent in the co-suppression of genes in transgenic plants (see at least, page 279, Abstract).

Therefore, given the breadth of the claims, the limited guidance provided the specification, the unpredictability regarding antisense, and the state of the art, as discussed above and in the last Office action, the claimed invention is not enabled

throughout the broad scope. The rejection is maintained.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 8 is rejected under 35 U.S.C. 101 because the claimed invention is directed to a non-statutory subject matter. The claim does not read, "transformed" or "transgenic". The seed may not contain the transgene of the parent plant. Due to chimerism, not all of the cells from a transgenic plant will comprise in their genome the transgene. If the seed does not contain the transgene, then the claim will read on the product of nature. It is suggested that the claim is amended to read ---Transgenic seed---.

Claim Rejections - 35 USC § 102

Claims 13, 16-17 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Hesse et al (US 5, 866,790). This rejection is repeated for the reasons set forth in the Office action of 06/30/04. Applicant's arguments filed in 11/0104 have been considered but are not deemed persuasive.

Applicant argues that instant claims are drawn to a method to manipulate cellulose concentration in the cell wall and to alter grain or stalk quality, which is not taught by Hesse et al (response, page 17).

This not found persuasive. The claims are drawn to a method of increasing cellulose production or cellulose concentration by transforming a plant cell with a recombinant expression cassette comprising any sucrose synthase polynucleotide operably linked to a promoter, regenerating a plant from said plant cell, wherein the polynucleotide is expressed for a time sufficient to modulate/increase the level of sucrose synthase. The claims do not recite any structural or functional limitations that distinguish the polynucleotide encoding sucrose synthase from the nucleic acid encoding sucrose synthase of the prior art. Hesse et al teach transforming plant cells with a DNA construct comprising a nucleic acid sequence encoding a sucrose synthase operably linked (in sense or antisense orientation) to a promoter that directs expression in seed or stem tissues, and transformed plants expressing said polynucleotide regenerated from the transformed plant cells (columns 26-27; Examples 2-4; and claims). Therefore, Applicant's arguments are not persuasive.

Amending claims 13 and 17 to recite SEQ ID NO: would obviate this rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 13-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barry et al (US 5,716,837), in view of Fu et al (The Plant Cell, Vol. 7, pp. 1369-1385, 1995).

The claims are drawn to a method of increasing cellulose production or cellulose concentration by transforming a plant cell with a recombinant expression cassette comprising a sucrose synthase polynucleotide operably linked to a promoter, regenerating a plant from said plant cell. The claims further encompass transformation of specific plant species and the use of Sus1, Sh1 or Sus3 polynucleotides from maize, and promoter for pericarp or seed specific expression of cellulose synthase.

Barry et al teach transformation of a plant with a heterologous DNA encoding sucrose phosphorylase for increased level of starch in specific tissues including root, seed and fruit, of the plant. The cited reference further teaches use of organ-specific tissues in the transformation construct, and transformation and regeneration of specific plant species including those listed in claims 14 and 18. The cited reference suggests that genes encoding other enzymes involved in starch synthesis can also be used for plant transformation (see the whole document).

Barry et al do not specifically teach a DNA encoding sucrose synthase for plant transformation.

Fu et al teach that genes encoding sucrose synthase from plants are known in the prior art and used for plant transformation. The cited reference teaches Sus1 and Sus2 of maize, Sus3 and Sus4 of potato, and suggests transformation of plants with said genes (see the whole document).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the application was filed to use the method of transforming a plant with a DNA encoding a sucrose biosynthetic enzyme for increased level of sucrose or starch as taught by Barry et al, and to modify that method by incorporating any one of the known sucrose biosynthesis enzyme encoding DNA including sucrose synthase genes known in the prior art as taught by Fu et al, with a reasonable expectation of success. One would have been motivated to use a sucrose synthase gene because of the availability of various sucrose synthase genes from plants and the importance of the genes in altering sucrose and starch biosynthesis as suggested Fu et al. One of ordinary skill in the art can readily transform a plant including those listed in claims 14 and 18 with any one of the functionally known sucrose synthase genes with an appropriate promoter; and given that Sus1, sh1 of maize and promoters for pericarp or seed-specific expression are known in the prior art as evidenced by both Barry et al and Fu et al, without any unexpected results. Therefore, the claimed invention as whole was *a prima facie* obvious. See In *re Lindner*, 173 USPQ 356 (CCPA 1972) and *In re Grasselli*, 218 USPQ 769 (Fed. Cir. 1983), which teach that the evidence of unexpected results should

be commensurate with the scope of the claims. In this case, Applicants' unexpected result, namely, the isolated DNA encoding SEQ ID NO: 2 or 12, transgenic plant comprising it, and a method of using said polynucleotide are not commensurate with any polynucleotide encoding sucrose synthase or methods of its use.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 6, 472, 588 (Haigler et al, filed September 1999).

Remarks

The polynucleotide of SEQ ID NO: 1 and 11 and polynucleotides encoding SEQ ID NO: 2 or 12 are free of the prior art, as stated in the last Office action.

No claim is allowed.

Contact information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Medina A. Ibrahim whose telephone number is (571) 272-0797. The Examiner can normally be reached Monday -Thursday from 8:00AM to 5:30PM and every other Friday from 9:00AM to 5:00 PM. Before and after final responses should be directed to fax nos. (703) 872-9306 and (703) 872-9307, respectively.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Dr. Amy Nelson, can be reached at (571) 272-0804.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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6/23/04

Mai

MEDINA A. IBRAHIM
PATENT EXAMINER